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STATE OF MINNESOTA

DEPARTMENT POLLUTION CONTROL AGENCY

Office Memorandum

TO : Stephen Shakman
Special Assistant
Attorney General

DATE: JUN 27 1980

FROM : Richard Ferguson, Hydrogeologist
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SUBJECT: MEETING BETWEEN REILLY TAR AND CHEMICAL CONSULTANT, ERT, AND THE USGS

On April 21 and 22, 1980, ERT personnel met with the USGS to gain an understanding of the scientific investigations that have been, or soon will be, completed on the area impacted by Reilly Tar and Chemical. The meeting was held at the request of ERT, and it took place at the USGS offices in St. Paul. The questions by ERT personnel were focused on sampling methodologies, the means of determining the hydrologic values to be inserted in the models, and the role the Hinckley well played in contaminating the Prairie du Chien-Jordan aquifer. The participants in the meeting were as follows:

Donald R. Albin	USGS	St. Paul, MN
Marc Hult	USGS	St. Paul, MN
Daniel C. Gillies	USGS	St. Paul, MN
William M. Gregg	ERT-Hydrogeologist	Pittsburgh, PA
Richard Cadwgan	ERT-Senior Hydrogeologist	Concord, Mass.
John C. Craun	ERT-Engineer (Chemical)	Pittsburgh, PA
Richard Ferguson	MPCA	Roseville, MN

The attached notes taken at the meeting are not a complete record of the dialogue. There is not a response for every question, nor is there necessarily continuity throughout the notes. An attempt was made to record the discussions using the terms expressed.

RRF:lmj

cc: Lovell Richie, Minnesota Pollution Control Agency
Richard Ferguson, Minnesota Pollution Control Agency
Marc Hult, U. S. Geological Survey

April 21, 1980

Marc Hult: There are 35 multi-aquifer wells within one square mile of the site. Those wells penetrating the Prairie du Chien-Jordan aquifer are most likely to have flow. Seven wells that were verified as having flow into the Prairie du Chien-Jordan aquifer also had a coal-tar odor.

There have been two wells on the Reilly Tar and Chemical site. The well identified as W23, or the Hinckley Well, was drilled in 1917. Creosote entered the well from a ruptured tank in the twenties or thirties. A second on-site well was located approximately 200 feet south of W23. The well was drilled in 1899 for the sugar beet company. The well was probably abandoned in the thirties.

In all, over 300 wells have been identified on two topographic quadrangles. Of these, approximately 150 wells are located within a couple square miles of the site.

Coal-tar solubilities vary over eight orders of magnitude.

The drift has been highly contaminated with sodium from sodium sulfate liquors. Sodium is nonconservative. The thickness of the unsaturated zone varies from 0 to 50 feet.

Dick: What about contamination of soil samples with drilling fluid? Who selects the portion of the core for analysis, and what method of analysis is used?

John: What is Hans-Olaf Pfannkuch (HOP) doing with soil columns?

Marc: HOP is working with 40 mm glass columns using Ottawa sand and cable tool cuttings from the site. Sodium chloride is used for the dispersion curve. A conservative tracer was used on the Ottawa sand. The purpose of the soil column work is to define the retention and mobility of the organic compounds. Napthalene was the first organic chemical to be run. The working medium is fine to silty sand with fine layers of organic peat. An important aspect of the study is the effects on the organics during the transport of the coal-tar.

-Questions on Modeling-

Marc: SWIP is a two part model, an aquifer and well bore model, and a finite difference model.

Dick: How do you get hydraulic conductivity?

Marc: The most important thing we do is visually inspect the sample. A particle size distribution can be done to estimate hydraulic conductivity (K).

Dick: I do not believe K can be adequately defined from a particle size distribution.

Marc: Pumping tests will also be used to estimate K.

Dick: Concerned about reliability of data, assumptions in model, and how model will be used.

Dick: Why wasn't the isolation concept put forth (bentonite slurry wall)? ?

Marc: The USGS is conducting three studies; a regional study which includes the Paleozoic rocks in six states, a local study which includes seven counties, and the St. Louis Park study. The contract for the St. Louis Park study ends June 30, 1980. Model calibration is scheduled for next year. The USGS will be monitoring the effects of the remedial action.

John: How good are the flow rate predictions in the Barr study?

Marc: I am in disagreement with their methods.

John: What about other sources of contaminants?

Marc: We are not looking at specific compounds. We are looking at sodium, napthalene, and other compounds to form a large picture. Differences in the solubility and sorption of compounds results in a systematic difference in their distribution. You cannot take a single sample and lay claims to the flow path of the contaminants.

Dick: How do you contaminate the Prairie du Chien-Jordan aquifer while pumping 60 gpm? When do you assume the hole in the casing of the Hinckley well first appeared?

Marc: Because the flux is high, it is not critical whether you assume the hole first appeared in 1935 or 1945.

John: Could old St. Louis Park Well #1 have been contaminated from the Hinckley well?

Marc: Discussed how he would clean up the Hinckley well. A four inch casing with a two inch eductor could be installed to steam lift tar out. An adjacent well could be put in and pumped heavily to avoid contamination by remobilization.

Dick: How have you handled historical pumping?

Marc: There is a good record on ground water use in the area. Twelve industrial wells have been monitored for City sewage fees. There is also a good record on municipal wells. The most significant problem is the interflow through uncased wells.

Dick: How do you go about finding multi-aquifer wells?

Marc: There are probably 12 significant multi-aquifer wells in the Prairie du Chien-Jordan aquifer. There has been no significant mass flux from Platteville to St. Peter in multi-aquifer wells. This is due to the skin effect building on the St. Peter in unused wells. Used wells are more of a problem since there is no significant skin effect.

Marc: Multi-aquifer wells may be more important to the transmission of wastes than buried bedrock valleys--which may be filled with impermeable material.

John: Have you done time series on organics?

Marc: Yes, there is a liquid and a hydrocarbon phase. After a few minutes of pumping, the hydrocarbon phase decreases.

Dick: How do you know what the sample was prior to pumping? This method of sampling may effect the chemical analysis of the water in the well.

John: Are the two phase wells all drift wells?

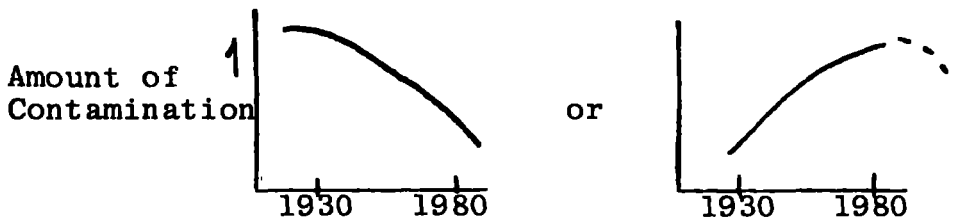
Marc: We will be sampling the fluid phases separately. The two phase contamination is in the southern area of the site.

-Lunch Break-

John: How was the analytical data generated?

Marc: ERT can have water quality information from the data base. The organic water quality information is not in the data base because there are no STORET identification numbers.

John: Are we at the tail end of the problem?



John: Would like information on soil column studies being conducted by HOP.

Marc: Will provide ERT with base map. SWIP is available through NTIS.

W33?

Marc: W33 was very dirty prior to the reconstruction from a Platteville-St. Peter multi-aquifer well to a St. Peter well only.

John: What is the source for and the type of contaminants used in the model?

Marc: Bill Scrutin has spiked samples to determine the recovery capabilities of the analysis.

Marc: Micelles may not be that important because solution channels in the Platteville may be filled with sand from the drift above, thus inhibiting the movement of aggregates of coal-tar. Marc had observed during the installation of monitoring wells that sand had filled voids in the carbonate rock.

John: How do you know the micelles plug the voids rather than deform and pass through?

John: Why look at such a large number of organic compounds?

Marc: We look at inorganic constituents as a matter of policy, to gain a better understanding of the problem.

Dick: Chloride tracers are a poor choice because of road salt and natural chloride in aquifer.

Marc: Zinc is not used because of the zinc in galvinized pipe.

-April 22, 1980-

Marc: Water is entering the well from a hole in the casing at a depth of 213 feet from the basal St. Peter confining bed. Water was cascading down inside of dirty coal-tar coated casing. The water leaves the well at a depth of 260 feet and enters the Prairie du Chien-Jordan aquifer. There may have been a pump in the well at a depth of 160 feet, pumping at 60 gpm. The source of the contamination is the coal-tar on the drop pipe and more importantly the coal-tar in the solution channels of the Prairie du Chien Formation. The bearings in the pump were repeatedly frozen by coal-tar. Although not known for sure, the water in the St. Peter is probably good. The water coming in from the St. Peter was at a rate of 150 gpm, the pump operated at 60 gpm; therefore, the flow into the Prairie du Chien was 90 gpm.

ERT personnel do not think W23 could be the major source of the contamination. Dick believes the coal-tar on the casing is not in contact with the water long enough to contaminate the water. Marc believes the coal-tar is moving in the form of particles down the well bore. Dick wants to know where these particles are coming from.

Marc: The mass discharge of contaminants down the buried bedrock valley is much less than originally thought. Head changes in the valley were thought to be part of the natural flow system; however, some of the head changes have now been attributed to flow down a well.

Marc: The Hinckley well played an important role early in the history of the problem. More recently, multi-aquifer wells have played a major role in the spread of the contaminants.

Marc: Twenty-five wells have been tested for inorganic and organic chemicals. By next month, 75 wells from the drift, Platteville, St. Peter, and Prairie du Chien-Jordan aquifer will be sampled for organic and inorganic chemicals.

ERT Requested:

1) The organic and inorganic analyses on the 25 wells.

2) The MDH analyses for PAH compounds from the January 1980 sampling.

3) Analyses from the well abandonment program.

4) All geophysical logs.

5) Methodology of PAH analysis from Bill Scrutin.

6) Methodology of coal-tar experiment by HOP.

7) Copy of Water Resources Outlook for the Twin Cities.

Dick: Would like to discuss the movement of coal-tar material in limestone with Calvin Alexander of the University of Minnesota, Geology Department.

Marc: The modeling parameters are based on:

1) Visual inspection

2) Particle size analyses of cores

3) Pumping tests (to be done on drift and Platteville aquifers)

4) Literature on bedrock

5) Permeability analyses of drift (1) and Glenwood shale (3)

6) X-ray diffraction of clay

The particle size analyses will come from the Barr study, Twin City Testing, and work by the USGS. Permeability analyses will come from field tests and work by HOP.

ERT: Requested PCA supply them with Phase 1 of the Barr report. They took with them a base map, tables of well locations, and PAH analyses on the well network.